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Planning for Management of Radiation Incidents



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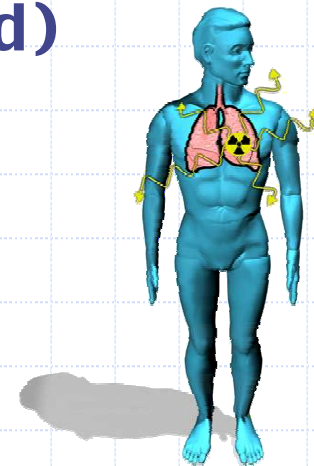
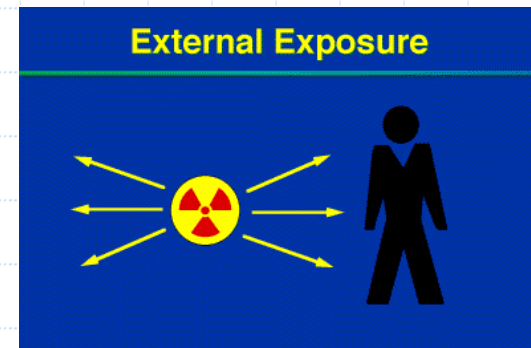
For What Types of Accidents or Incidents Should You Be Prepared?

- ◆ Industrial and medical uses of radiation
- ◆ Transportation accidents
- ◆ Radiography over-exposures
- ◆ Release from fixed nuclear facility (e.g., reactor)
- ◆ Malicious/terrorist events
 - radiological dispersal device
 - intentional irradiation
 - nuclear weapon



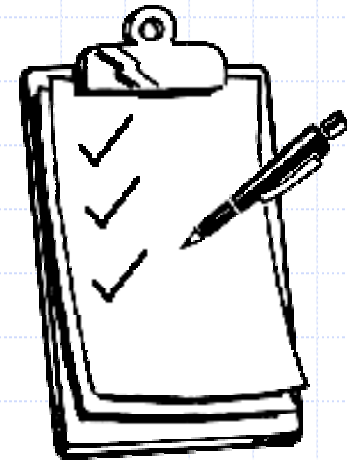
What Categories of Radiation Injury or Exposure Can You Expect?

- ◆ **External Irradiation Only:**
 - whole body?
 - partial body?
 - local?
- ◆ **Internal Contamination (inhale, wound)**
- ◆ **External + Internal**
- ◆ **Combined (Radiation + Injury)**



General Guidelines for Planning and Response

- ◆ **Establish Your Response Procedures:**
 - **To the extent practicable, use procedures and equipment with which you are already familiar (e.g., isolation, HAZMAT)**
- ◆ **Prioritize treatment based on threat to victim**
- ◆ **Use Pre-established Checklists**
- ◆ **Get Expert Assistance**



Questions for Facility Preparation & Planning

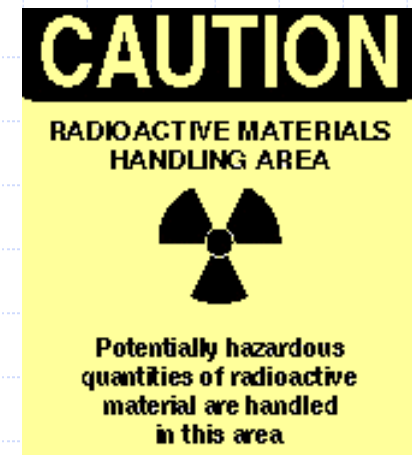
- ◆ Where is the contaminated/injured patient going to be delivered?
- ◆ Where is the contaminated/injured patient going to be initially treated?
- ◆ How will this affect other ER operations?
- ◆ How will this affect patient access?
- ◆ What is the potential for spread of contamination and temporary loss of facilities?

Guidelines for Facility Preparation and Planning

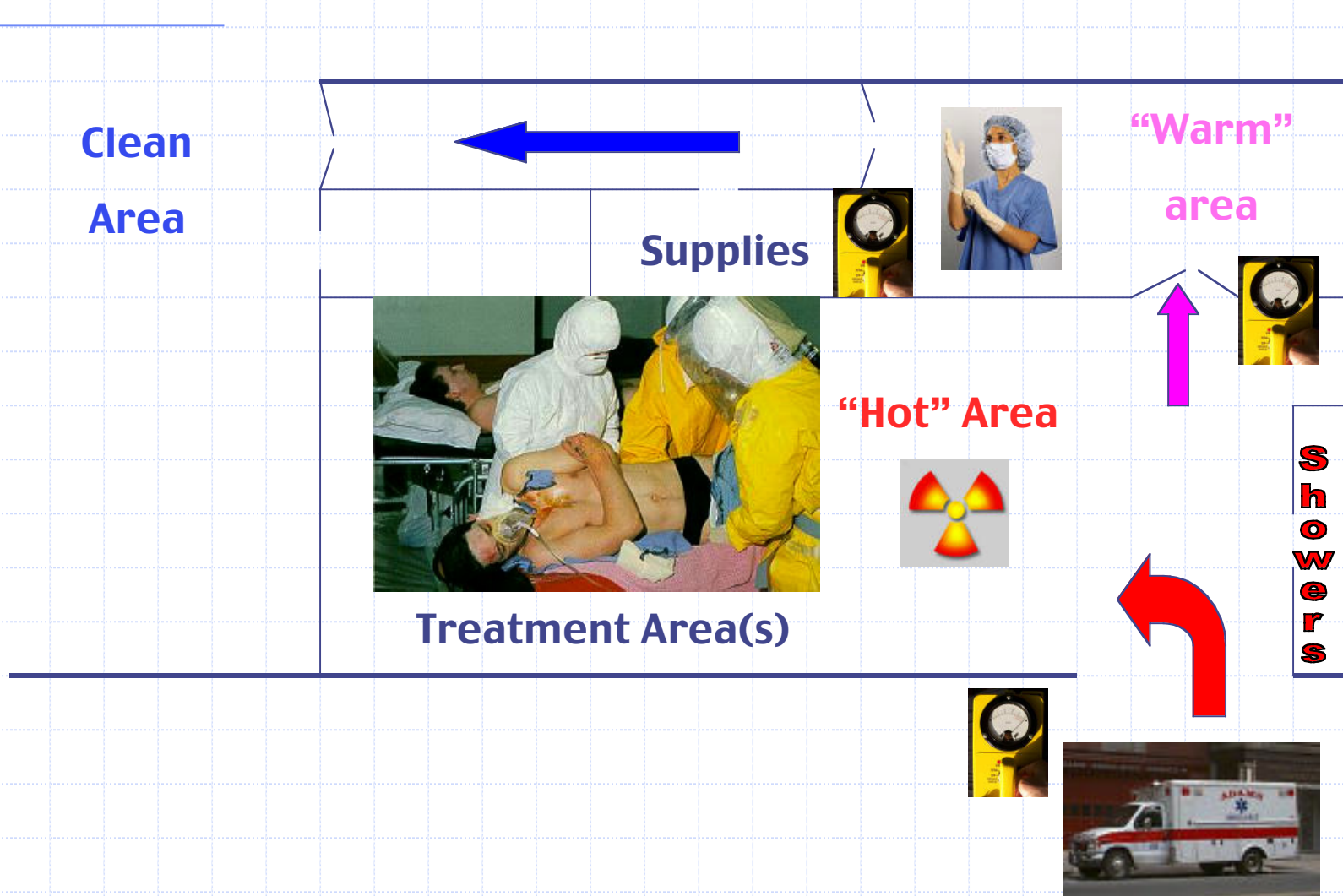
- ◆ **If practicable, select a treatment area that can be easily isolated from the rest of the facility (room for expansion??)**
- ◆ **Use facility drawings and maps to:**
 - **plan routes of entry/egress for people and equipment**
 - **identify contamination control zones & lines**
 - **identify potential contamination paths**
 - **identify ventilation flow**

Planning for Control of Radioactive Contamination

- ◆ You don't need "rocket science" – common sense will do just fine
- ◆ Think about pathways of contamination transfer, for example:
ambulance → shoes → floor → cafeteria → double-cheeseburger
- ◆ Look at a diagram of your facility
- ◆ Consider traffic and people patterns
- ◆ Think about movement of items & equipment
- ◆ Set up barriers, control lines, and monitoring



Schematic Diagram of Radiation Treatment Area

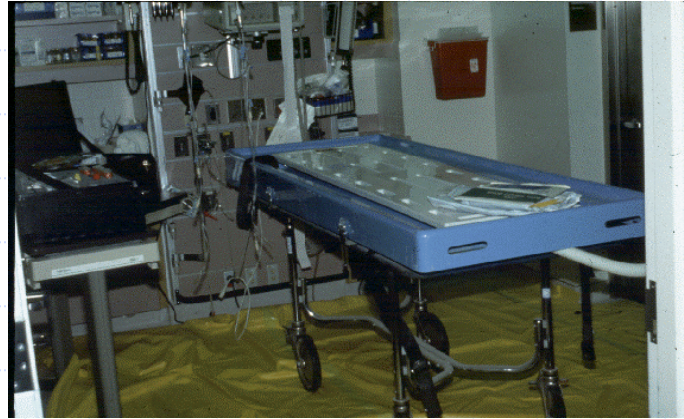


Plan for Good Contamination Control Techniques

- ◆ **Set up controlled area (large enough)**
 - ◆ **Cover floors/surfaces if practicable**
 - ◆ **Restrict access – minimize people & equipment**
 - ◆ **Use isolation techniques (e.g., protective clothing, double bagging)**
 - ◆ **Change outer clothing/gloves frequently**
 - ◆ **Dispose of waste properly**
 - ◆ **Use “buffer zone” as an added precaution**
 - ◆ **Monitor ALL people & things leaving controlled area**
 - ◆ **Control ventilation from contaminated area(!)**

Facilities for Patient Decontamination

- ◆ “Decontamination table?”



- ◆ Shower facility for ambulatory and non-ambulatory patients
- ◆ Facilities for decontamination of large numbers of patients?
- ◆ Collection of contaminated fluids??

Staffing of Radiological Emergency Response Team

- ◆ Define roles & responsibilities
- ◆ Segregate tasks
 - Team Coordinator
 - ER Physician(s)
 - ER Nurse(s)
 - Triage Officer
 - Infection (Contamination) Control Nurse
 - Etc.
- ◆ Identify back-ups
- ◆ Provide training



Consider Potential Impact on Normal Hospital Operations

- ◆ **Possible contamination of (and denial of use) of ER facilities**
- ◆ **Drain on normal ER staff**
- ◆ **Media coverage**
- ◆ **Psychological reaction of other patients**
- ◆ **Psychological reaction of members of the public**
- ◆ **Psychological reaction of hospital staff**

Pre-stage Your Supplies & Equipment

- ◆ Protective clothing (gowns, masks, gloves, etc.)
- ◆ Contamination control supplies (tape, bags, etc.)
- ◆ Radiological monitoring instruments
- ◆ Containers for contaminated waste
- ◆ Use labeled storage bins or drawers
- ◆ Copies of procedures and checklists
- ◆ Contact names and phone numbers



How Will You Manage Large Numbers of Radiation Casualties?

- ◆ **TRIAGE based on:**
 - **obvious injury & trauma**
 - **signs and symptoms of radiation injury**
 - **physical vs. psychological symptoms?**
 - **history (e.g., “where were you when the bomb went off?”)**

- ◆ **Staging areas? Traffic control?**



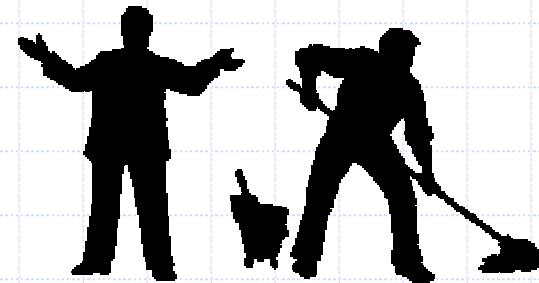
Don't Underestimate the Psychological Aspects of Radiation Accidents

- ◆ **The news media has instilled an irrational fear of radiation into the public – thus “setting the stage” for over-reaction.**
- ◆ **Even experienced radiation workers have experienced severe psychological stress when involved in accidents.**
- ◆ **Expect panic, over-reaction, and irrational responses (e.g., fear and anger).**



You Will Also Need a Recovery Plan

- ◆ Prioritize areas, facilities, and equipment to be recovered
 - What will be needed ASAP?
 - What can wait a few days?
- ◆ Establish a checklist for recovery
- ◆ Establish survey methods and “release” criteria
 - How “clean” is clean enough?
 - Consider regulatory requirements, public/patient perception, and potential legal issues



Training Scenario #1:



- ◆ News reports of RDD exploded downtown (miles away and downwind from your facility)
- ◆ Your hospital starts to get dozens of local “walk-in” patients – many fearful, some presenting with nausea and vomiting
- ◆ Several patients are demanding the “anti-radiation pills” they have heard about on TV.

WHAT DO YOU DO NOW??

Training Scenario #2:

- ◆ **News reports of RDD explosion – stolen industrial radiography source mentioned.**
- ◆ **Ambulance delivers two patients – both with severe trauma injuries and high levels (100,000 counts per minute) of beta–gamma contamination.**

WHAT DO YOU DO NOW??

Training Scenario #3:

- ◆ **There has been some sort of radiological explosion incident, and you have received (and are treating) a contaminated injured patient.**
- ◆ **You get word on the radio that a dozen more injured and contaminated patients are en-route to your facility.**

WHAT DO YOU DO NOW??

End of Presentation



References for Management of Radiation Accidents (1)

- ◆ Mettler, et al., “Medical Management of Radiation Accidents,” CRC Press Inc. 1990 (<http://www.crcpress.com/>)
- ◆ Hubner & Fry, “The Medical Basis for Radiation Accident Preparedness” Elsevier/North-Holland, 1980
- ◆ Ricks & Fry, “The Medical Basis for Radiation Accident Preparedness II – Clinical Experience and Follow-up Since 1979, Elsevier, 1990
- ◆ Ricks, ed., “The Medical Basis for Radiation-Accident Preparedness – The Clinical Care of Victims, The Parthenon Publishing Group (CRC Press) 2002
- ◆ NCRP Report #65, “Management of Persons Accidentally Contaminated with Radionuclides” 1980 (<http://www.ncrp.com/>)
- ◆ NCRP Report # 138, “Management of Terrorist Events Involving Radioactive Material” 2001 (<http://www.ncrp.com/>)

References for Management of Radiation Accidents (2)

- ◆ Mettler & Moseley, “Medical Effects of Ionizing Radiation,” Grune & Stratton Inc., 1985
- ◆ Conklin & Walker (AFFRI), “Military Radiobiology,” Academic Press Inc. 1987
- ◆ Gerber, ed., “Guidebook for the Treatment of Accidental Internal Radionuclide Contamination of Workers” Radiation Protection Dosimetry Vol 41, No 1, 1992.
(<http://www.ntp.org.uk/index.html>)
- ◆ IAEA, “Planning the Medical Response to Radiological Accidents,” Safety Reports Series No. 4, IAEA/WHO, 1998.
- ◆ IAEA, “Diagnosis and Treatment of Radiation Injuries,” Safety Reports Series, IAEA 1998.

IAEA Publications are available from:

(http://www.bernani.com/Online_Catalog/Publisher_Index.asp?Alpha=I&AgencyID=31)

Web Resources for Management of Radiation Accidents

- ◆ Radiation Emergency Assistance Center/Training Site –
<http://www.orau.gov/reacts/>
- ◆ General Radiation Safety Info (Oak Ridge Associated Universities: <http://www.orau.com/ptp/infores.htm>
- ◆ CDC Guidance on Potassium Iodide
<http://www.fda.gov/cder/guidance/4825fnl.htm#KI%20Use%20in%20Radiation%20Emergencies:%20Treatment%20Recommendations>
- ◆ Armed Forces Radiobiology Research Institute
<http://www.afrrri.usuhs.mil/>
- ◆ 2000 Emergency Response Guidebook (on-line)
http://www.tc.gc.ca/canutec/erg_gmu/erg2000_menu.htm
- ◆ DTRA Nuclear Accident Response Procedures (NARP) Manual
http://www.dtra.mil/cs/cs_narp.html
- ◆ Disaster Preparedness for Radiology Professionals
http://www.acr.org/departments/educ/disaster_prep/disaster-planning.pdf

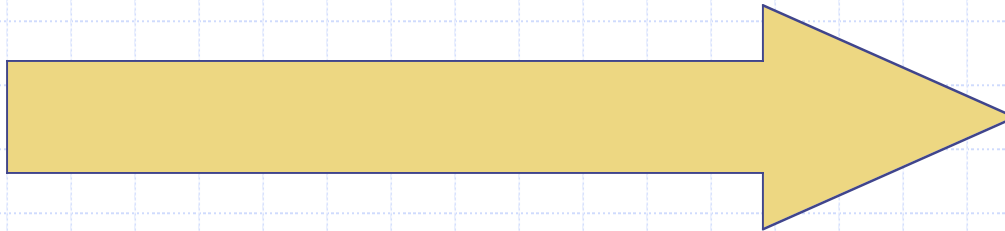
More Web Resources for Management of Radiation Accidents

- ◆ Loyola University (Chicago)

<http://www.meddean.luc.edu/lumen/MedEd/radiation/Radaccident/homepage.html>

- ◆ xxx

Spare Overheads



Consider Use of Floor Covering *(If you have time)*

- ◆ **Rolls of “butcher” or wrapping paper, 3 to 4 feet wide**
- ◆ **Make pathway from ambulance entrance to treatment room**
- ◆ **Cover floor of treatment room**
- ◆ **DO NOT create a tripping hazard! Tape the covering securely to the floor**

Think about Ventilation Control

- ◆ Purpose is to prevent airborne contaminated dust from spreading through ventilation system
- ◆ More likely to be a nuisance (vs. health) problem but may be expensive to clean up
- ◆ Filtered or diverted air exhaust is best solution
- ◆ Temporary filters or covering exhaust may be adequate temporary solution

Accident/Incident with Industrial/Medical Source

- ◆ Intense source of gamma radiation
- ◆ Sources can become separated or removed from shielding
- ◆ Potential for severe local and whole body irradiation
- ◆ Exposure is typically unrecognized until symptoms occur
- ◆ Look for burn-like injuries with no history of thermal insult – nausea, vomiting with no apparent cause

Transportation Accident



- ◆ Get history & accident description
- ◆ Information about radioactive material should be available
- ◆ Serious radiation injuries unlikely due to packaging/shielding regulations
- ◆ Possibly low-levels of contamination
- ◆ Possibly minor external irradiation

Intentional (Malicious) Irradiation

- ◆ **Source intentionally hidden in occupied area**
- ◆ **Watch for signs & symptoms consistent with radiation exposure, but with no other apparent cause – for example:**
 - **skin-reddening or burn-like injury with no history of thermal insult**
 - **nausea, vomiting, diarrhea with no history of illness or food-borne disease**

Radiological Dispersal Device (RDD)

- ◆ **Close to site of explosion:**
 - **Possible trauma injuries**
 - **Possible high whole body or partial body irradiation + high levels of contamination**
 - **Possible inhalation/imbedding of radioactive material (unlikely to be life-threatening)**
- ◆ **Away from site of explosion:**
 - **Serious radiation injuries VERY unlikely**
 - **Significant psychological impact**
 - **Nuisance levels of contamination**

Improvised Nuclear Weapon (Hiroshima-size, in city)



- ◆ Hundreds of thousands of immediate fatalities due to blast, heat, and “prompt” radiation
- ◆ Thousands exposed to high (and possibly lethal) levels of radiation from fallout
- ◆ High levels of fallout would extend for many miles downwind
- ◆ Thousands of evacuees potentially exposed to fallout contamination
- ◆ Health care system would be overwhelmed